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09/988,658	11/20/2001	Akira Oosawa	Q66559	8995

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EXAMINER
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LAVIN, CHRISTOPHER L

ART UNIT	PAPER NUMBER
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2624

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary**

Application No.

09/988,658

Applicant(s)

OOSAWA, AKIRA

Examiner

Christopher L. Lavin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 March 2007.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

1. This action is in response to the RCE filed on 03/13/07.

#### ***Claim Rejections - 35 USC § 103***

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Claims 1 – 6, 8 – 13 and 17 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kano (5,359,513) in view of Jatko ("Nonlinear filter derived from topological image features", SPIE Vol. 1295 Real-Time Image Processing II, 1990).

In regards to claim 8, Kano discloses An apparatus for detecting suspected anomalous shadows, comprising: an interimage processing means for obtaining a difference image representing a difference between two images, which have been obtained of a same subject at different photographing times, by subjecting said two images to an interimage process to obtain the difference between said two images (Kano discloses an interimage processing means in the paragraph starting at column 2, line 20. In the paragraph Kano discloses that a "pair of temporally sequential chest images" are used to obtain a difference image. One of the two images is aligned to the second image before the difference image is formed.), [an image processing means for obtaining a processed difference image by subjecting said difference image to an image process wherein an actual difference between the two images on which said difference image is based is enhanced relative to artifacts appearing due to misalignment of a position of a structural element of the subject on one of the two images from a corresponding position of the structural element on the other of the two images], and a

detecting means for detecting the actual difference between the two images from the processed difference image as suspected anomalous shadows (In the paragraph starting at column 14, line 3 Kano discloses that a CAD system can be used for the detection of abnormal shadows, "Also, existing computer-aided diagnosis schemes for the detection of abnormalities in the chest images".).

As applicant has argued in remarks to the prior office action of this case, Kano does not perform an image processing operation intended to remove artifacts from the difference image. However in the field of image processing it is well known to remove small artifacts resulting from alignment errors as shown by Jatko (abstract and p. 12, final paragraph – p. 14, first paragraph) using morphological filters.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use morphological filtering (as taught by Jatko) on the difference image created by Kano. As Jatko teaches (abstract) image artifacts result when a difference image is formed. Jatko further states (first full paragraph on page 9) that uncorrected these artifacts could be misinterpreted as flaws (in the case of Kano abnormal shadows). Therefore filtering to remove the artifacts will result in a more accurate image analysis as a primary source of error will be removed.

In regards to claim 9, An apparatus for detecting suspected anomalous shadows as defined in claim 8, wherein the image processing means is a means for carrying out a process which suppresses the artifacts more than the actual difference between the two images (Jatko: As previously shown the morphological filters are designed to

remove the artifacts will leaving the actual difference. Thus the artifacts will be suppressed far more than the actual difference image by the filtering operation.).

In regards to claim 10, An apparatus for detecting suspected anomalous shadows as defined in claim 9, wherein as a means for carrying out the process which suppresses the artifacts more than the actual difference between the two images, the image processing means performs a process based on a morphology process employing structuring elements that are larger than the artifacts while smaller than the actual difference (Jatko: p. 12, final paragraph – p. 14, first paragraph and figure 4: As seen the erosion filter in the first operation will remove artifacts that are smaller than the kernel.).

In regards to claim 11, An apparatus for detecting suspected anomalous shadows as defined in claim 8, wherein the image processing means is a means for carrying out a process which enhances the actual difference between two images relative to the artifacts (By suppressing the artifacts Kano as modified by Jatko is enhancing the actual difference.).

In regards to claim 12, An apparatus for detecting suspected anomalous shadows as defined in any of claims 8, 9, 10, or 11, wherein the interimage process is a subtraction process in which the structural positions of the two images are correlated and a subtraction process is performed therebetween (Kano: col. 2, lines 20 – 28: Image registration is correlation.).

In regards to claim 13, An apparatus for detecting suspected anomalous shadows as defined in any of claims 8, 9, 10, or 11, wherein the two images upon which

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the interimage image is based are radiation images that have been obtained of the same subject in a temporal series, each of said images having been obtained at a different time, and which become the objects of a comparison to determine temporal change (Kano discloses in the paragraph starting at column 5, line 1 that an "interval change enhancement between a pair of temporally sequential chest images, including the steps of digitization of a pair of chest radiograph images..." is performed.).

In regards to claims 1 – 6, claims 1 – 6 are rejected for the same reasons as claims 8 – 13. The argument analogous to that presented above for claims 8 – 13 is applicable to claims 1 – 6.

In regards to claims 17 and 19, Jatko discloses a 3x3 kernel for filtering out artifacts. The 3x3 filter would completely remove a rectangular (square) or "circular" shaped object that has dimensions smaller than 3x3, which is normally the size of noise. Therefore Jatko is designed to remove artifacts which are circular or rectangular shaped.

In regards to claims 18 and 20, Jatko discloses in figure 4 an artifact that has an elongated shape.

4. Claims 7 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kano in view of Jatko as applied to claims 1 – 4 and 8 – 11 respectively, and further in view of Doi.

In regards to claim 14, Kano (as modified by Jatko) discloses an apparatus for detecting suspected anomalous shadows and in the paragraph starting at column 14,

line 3 that a CAD system (Doi) could be used to detect anomalous shadows. Kano however does not disclose that the shadows should be substantially round-shaped.

Doi teaches in the paragraph starting at column 8, line 47 that "true nodules generally contained high circularity". Nodules are abnormal shadows. Doi uses the fact that shadows are normally highly circular to detect abnormalities.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use the knowledge taught by Doi that abnormalities are highly circular to detect the abnormal shadows in the apparatus disclosed by Kano. As taught by Doi circularity is a very accurate way of detecting abnormal shadows, using that knowledge makes detecting abnormal shadows much easier.

In regards to claim 7, claim 7 is rejected for the same reasons as claim 14. The argument analogous to that presented above for claim 14 is applicable to claim 7.

5. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Kano, Jatko and Li (6,594,378).

In regards to claims 15 and 16, in the interview held on 03/28/07 the applicant's representative argued that Kano did not disclose global matching, but instead only focused on local matching. Although the terms, local and global are broad and not fully defined, to move prosecution forward on the case the examiner will provide a teaching that clearly shows the global and local matching the specification is calling for. Li teaches (col. 5, lines 1 – 38) that global and than local matching can be performed with lung images for better registration for use in image subtraction.

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention to use both global and local matching (as taught by Li) in the image registration process disclosed in the combination of Kano and Jatko. Li teaches that using both global and local matching will result in better registration and fewer misregistration errors (i.e. noise). The better the registration the better the overall image will be as fewer artifacts will exist and therefore there are fewer mistakes to be made in the artifact suppression stage.

### ***Response to Arguments***

6. Applicant's arguments with respect to claims 15 and 16 have been considered but are moot in view of the new ground(s) of rejection.

7. The examiner agrees that Kano does not teach the global matching the applicant intends, whether the claimed language actually requires such limitations the examiner feels is irrelevant as there are many references that teach the concept in the manner the applicant intends. Therefore to move prosecution forward the examiner provided the new rejection for claims 15 and 16. In the conclusion the examiner will also cite several other references that teach global and local matching.

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

9. US Pat. 5,970,182 – discloses global and local matching for image registration.

10. US Pat. 5,982,915 – discloses global and local matching for image registration.



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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher L. Lavin whose telephone number is 571-272-7392. The examiner can normally be reached on M - F (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh M. Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Christopher Lavin



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